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Geologic Map of the Twin Falls Quadrangle, Jerome, and Twin Falls Counties, Idaho Disclaimer: This Digital Web Map is an informal report and may be revised and formally published at a later time. Its content and format may not conform to agency standards. Kurt L. Othberg, John D. Kauffman, and Virginia S. Gillerman 2005 715, 114°22′30″ 114°30' 114°22′30″ 715000m.E. Field work conducted 2002-2004. Base map from USGS digital raster graphic, 1992. This geologic map was funded in part by the USGS National Cooperative Topography by photogrammetric methods from aerial photographs taken 1956, 1957, 1962. Information shown has been updated from aerial phographs taken 1987 and field checked. Map edited 1992. Conflicts may exist between Digital cartography by Jesse S. Bird and Jane S. Freed at the Idaho Geological some updated features and previously mapped contours. Survey's Digital Mapping. 1927 North American Datum. Map version 11-29-2005. PDF map (Acrobat Reader) may be viewed at idahogeology.org. Projection and 10,000-foot grid ticks based on Idaho coordinate system, Contour interval 10 feet

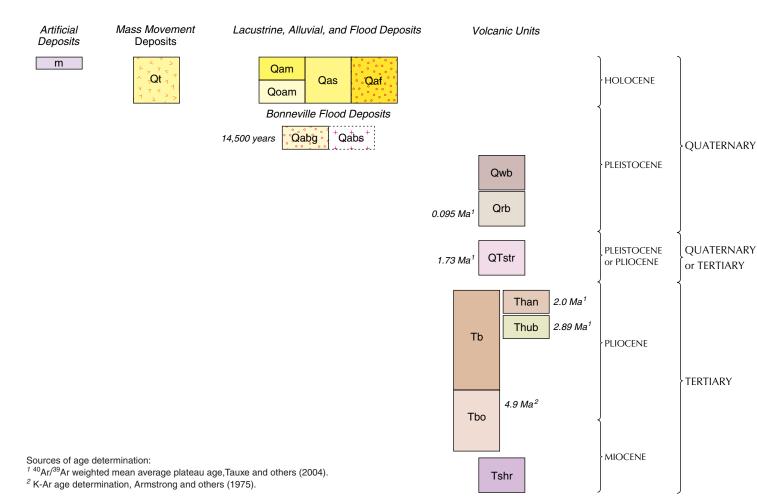
Supplementary contour interval 5 feet.

1000-meter Universal Transverse Mercator grid ticks, zone 11.

UTM Grid and 1992 Magnetic North Declination at Center of Map

National geodetic vertical datum of 1929.

CORRELATION OF MAP UNITS



INTRODUCTION

The geologic map of the Twin Falls 7.5' quadrangle identifies both the bedrock and surficial geologic units. It shows the geographic distribution of rock types at the surface and in the shallow subsurface. Basalt is the principal rock type in the area. South of the Snake River Canyon the basalt surface is mantled with wind-blown silt that forms the soils that are cultivated. The geologic units in the area control soil development, slope stability, groundwater movement and recharge, and geotechnical factors important in construction design and waste management. Land uses in the area include irrigated agriculture, rural and urban residential development, industrial and commercial enterprises, and dairy farms with confined animal feeding operations. The Snake River Plain aquifer underlies the area and discharges to the west of the Twin Falls 7.5' quadrangle as springs in the Snake River

Previous geologic studies include work by Gillerman and Schiappa (1994, 2001) who did an investigation of western Jerome County to assess groundwater vulnerability to contamination. Geology of the area south of the Snake River was compiled from previous mapping by Bonnichsen and Godchaux (1995). Earlier studies by Malde and others (1963) and Covington and Weaver (1990) were also reviewed. Field checking of these maps was combined with new field investigations in 2002-2004 of both bedrock and surficial geology. Exposures of the geology were examined and selectively sampled. Aerial photographs were studied to aid in identifying boundaries between map units through photogeologic mapping of landforms. In most areas map-unit boundaries (contacts) are approximate. Contacts are inferred where lack of exposures and poorly defined landforms prevent greater mapping precision. The information depicted at this scale furnishes a useful overview of the area's geology but is not a substitute for site-specific evaluations.

The Twin Falls 7.5¹ quadrangle lies near the center of the Snake River Plain, a large arcuate, lava-filled depression crossing southern Idaho. The incised Snake River Canyon cuts east-west across the north part of the quadrangle, and is the most prominent topographic feature. It exposes many nearly horizontal basalt flows. Some of the older basalt flows, exposed in the bottom of the canyon, are altered or weathered. Rhyolite forms a basement to the basalts and is exposed below Perrine Bridge and at Shoshone Falls. Thin layers of sediment and pillow basalt exposed in the canyon walls are evidence of local lakes and streams that existed while the Pleistocene shield volcanos were active. Approximately 500 years ago the Bonneville Flood filled the ancestral Snake River canyon, and flowed overland in the north part of the quadrangle forming relict cataracts such as above Blue Lakes. The flood scoured the canyon and some of the upland basalt surfaces and deposited coarse-grained gravel. Some of these deposits have been mined for aggregate.

DESCRIPTION OF MAP UNITS

ARTIFICIAL DEPOSITS

m Made ground (Holocene)—Artificial fills composed of excavated, transported, and emplaced construction materials typically derived locally. Primarily areas modified for fish ponds.

ALLUVIAL DEPOSITS

Alluvium of mainstreams (Holocene)—Channel and flood-plain deposits of the Snake River. Primarily stratified sandy silt and silty sand of bars and islands. Gravelly where channel is shallow and formed directly in basalt. Typically 1-10 feet thick.

Qoam
Older alluvium of mainstreams (Holocene)—Channel and flood-plain deposits of the Snake River that form a terrace 20 feet above river level. Primarily stratified sand and gravel overlain by silt and sand. Grades and interfingers laterally into colluvium and talus at the base of canyon walls.

Qas Alluvium of side-streams (Holocene)—Channel and flood-plain deposits of Rock Creek. Primarily stratified silt, sand and gravel.

Alluvial-fan deposits (Holocene)—Primarily stratified sand and silt that form small fans at the base of canyon walls. Thickness varies, but typically ranges 5-30 feet.

Bonneville Flood Deposits

Sand and gravel in giant flood bars (Pleistocene)—Boulders, cobbles, and pebbles of basalt in a matrix of basaltic sand. Forms giant expansion bars with large-scale crossbeds, and eddy deposits in which gravel sizes are smaller (O'Connor,). Similar to Melon Gravel (Malde and Powers, 1962; Malde and others, 1963; and Covington and Weaver, 1990), but restricted to Bonneville Flood constructional forms and deposits.

Scabland of flood pathways (Pleistocene)—Flood-scoured basalt surface. Character of scoured surface ranges from areas of original basalt morphology stripped of pre-flood soils, to areas where the original basalt surface has been plucked, gouged, and molded. Includes thin and discontinuous sheets and bars of flood sand and gravel that are not mapped at this scale. Some areas include pavements or strings of boulders transported by flood traction forces or that are lags from erosion by lower-energy regime during late stages

MASS MOVEMENT DEPOSITS

Talus (Holocene)—Angular pebble-, cobble-, and boulder-sized fragments of basalt that have broken off nearly vertical rock walls and accumulated below. Deposits are characterized by a steeply sloping surface that is at or near the angle of repose. Talus is not mapped where it partially covers basalt. Talus includes small deposits of eolian or water-reworked fine sand that typically occur at the toes of the talus slope.

BASALT UNITS

The surface geology of the Snake River Plain north of the Snake River is primarily Pleistocene basalt flows of the Snake River Group. On the Twin Falls 7.5' quadrangle, the Pleistocene basalt flows primarily originated from shield volcanoes to the northeast. Each volcano probably extruded numerous lava flows or flow lobes, although individual flows cannot easily be mapped because the surfaces are subdued by surficial deposits. Nearly all of the

basalt is vesicular to extremely vesicular and most of the units are also diktytaxitic to some degree (i.e., containing voids with protruding crystals). Even units with a fine-grained groundmass have a coarse, grainy texture. The topography south of the Snake River is formed by older basalt flows mantled with loess. These older basalts originated from shield volcanoes south and southeast of the quadrangle.

Basalt of Wilson Butte (Pleistocene)—Dark gray to black, fine-grained basalt with common to abundant plagioclase phenocrysts 1-3 mm in length and fairly common olivine grains up to 1 mm in diameter, and some plagioclase-olivine intergrowths. Remanent magnetic polarity is normal, as determined in the field and through laboratory analysis. Source is Wilson Butte located 20 miles northeast of Twin Falls city. The land surface is rough from common pressure ridges and has little or no drainage development. Gruhn (1961) reports a radiocarbon date of 15,000 years on tooled camel bones found inside a lava tube from Wilson Butte, constraining the eruption of the lava to before that time (Matthews, 2000).

Basalt of Rocky Butte (Pleistocene)—Fine-grained, dark gray to black, glassy basalt with common to abundant olivine grains 0.5-1 mm and clusters 1-3 mm in diameter. Common to abundant small plagioclase laths to about 1 mm in length. Remanent magnetic polarity is normal, as determined in the field and through laboratory analysis. Erupted from a shield volcano located 23 miles east-northeast of Twin Falls city, which shows a permanent horizontalcontrol mark labeled "Rocky" at 4526 feet on the south rim of the vent (sec. 14, T. 8 S., R. 20 E.). Equivalent in part to Sand Springs Basalt of Malde and Powers (1962), Malde and others (1963), and Covington and Weaver (1990). Covington and Weaver (1990) identified the source as "Butte 4526." Tauxe and others (2004) report an ⁴⁰Ar/³⁹Ar weighted mean plateau age of 0.095 Ma for "Sand Springs" basalt. The location of their sample, on the north rim of the Snake River canyon near Shoshone Falls, is from the unit we map as basalt of Rocky Butte. On the Twin Falls 7.5' quadrangle, 90 percent of the unit is outcrop because the surface was scoured by the Bonneville Flood (see Qabs).

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Basalt of Stricker Butte (Peistocene or Pliocene)—Described by Williams and others (1991) as light-gray to gray, medium- to coarse-grained, dense basalt with small plagioclase laths 1-2 mm long and olivine grains 0.4-0.5 mm in diameter; olivine is amber to reddish brown and probably altered to iddingsite. Erupted from Stricker Butte located located 8 miles southeast of Twin Falls city. Remanent magnetic polarity is reverse as determined in the field. Tauxe and others (2004) also report reverse polarity from laboratory analysis and an age determination of 1.73 Ma from a site on Rock Creek just south of Stricker Butte. No basalt pressure ridges rise above a loess mantle. Surface drainage is moderately well developed. Loess thickness ranges 5-25 feet and typically comprises a younger deposit with weak soil development and an underlying older loess with a thick caliche (duripan) horizon (Baldwin, 1925;

Basalt of Hub Butte (Pliocene)—Described by Williams and others (1991) as gray to dark gray, aphanitic or fine- to medium-grained plagioclase- and olivine-phyric basalt. Plagioclase phenocrysts range from 1-4 mm in length; olivine is amber and 0.5-1 mm in diameter and rimmed by, or altered to iddingsite. Our unit includes flows from a small butte (*Qo* unit of Williams and others, 1991) located on the northeast flank of Hub Butte near the confluence of Rock and Cottonwood creeks. Tauxe and others (2004) report normal magnetic polarity for Hub Butte, although Williams and others (1991) report reverse polarity. Tauxe and others (2004) also report an age determination of 2.89 Ma for Hub Butte and 2.94 Ma for older Hub Butte (the associated small butte noted above).

Basalt of Hansen Butte (Pliocene)—Described by Williams and others (1991) as gray, fine- to coarse-grained basalt with a few small phenocrysts of plagioclase 0.5-3 mm long and honey to amber olivine, rimmed by iddingsite, 0.3-1 mm in diameter. Erupted from Hansen Butte located 13 miles east-southeast of Twin Falls city. Tauxe and others (2004) report reverse magnetic polarity and an age determination of 2.0 Ma for a sample collected from the canyon wall north of Shoshone Falls in what was mapped as Hansen Butte basalt by Covington and Weaver (1990, unit *Qi7*). Williams and others (1991), however, report normal polarity for Hansen Butte but give no site location for their polarity determination. No basalt pressure ridges rise above a loess mantle. Surface drainage is moderately well developed. Loess thickness ranges 5-50 feet and typically comprises a younger deposit with weak soil development and an underlying older loess with a thick caliche (duripan) horizon (Baldwin, 1925; Ames, 2003).

Basalt flows, undivided (Pliocene?)—Fine- to coarse-grained, unaltered to altered, undivided basalt flows exposed in the Snake River canyon. Stratigraphically above *Tbo* unit and commonly separated from it by a thin orange baked soil or sediment horizon 1-2 feet thick. Source(s) unknown, but probably erupted from Tertiary shield volcanoes south of Twin Falls city. Age poorly constrained but probably includes flows from different sources of different ages.

Older basalt flows, undivided (early Pliocene to Miocene)—Medium- to coarse-grained, gray to sooty brown, mostly altered and (or) weathered basalt flows primarily exposed in the lower part Snake River canyon. Source(s) unknown, but probably erupted from Tertiary shield volcanoes south of Twin Falls city. Age poorly constrained but probably includes flows from different sources of different ages. One K/Ar age determination on this unit by Armstrong and others (1975), from an outcrop in the Snake River canyon 8 miles west of the quadrangle at the base of Clear Lakes grade, resulted in an age of 4.9±0.6 Ma. All flows included in this unit that were analyzed for remanent magnetism have reverse polarity, although all may not be age-equivalent and not all flows were analyzed. Equivalent to the Banbury Basalt of Malde and Powers (1962), Malde and others (1963), Covington and Weaver (1990), and Gillerman and Schiappa (2001). Extensively scoured by the Bonneville Flood (see *Qabs*).

RHYOLITE UNIT

Rhyolite of Shoshone Falls (Miocene)—Light gray to pinkish gray porphyritic rhyolite with a black porphyritic vitrophyre 10-15 feet thick at the top. Remanent magnetic polarity is normal as determined in the field and through laboratory analysis. Distribution is restricted to the bottom of the Snake River canyon. Best exposed at Shoshone Falls where its age may be about 6.25 Ma (B. Bonnichsen, written commun., 2005).

SYMBOLS

Approximate extent of Bonneville Flood at maximum stage.

Contact: Line showing the approximate boundary between one map unit and another. The apparent ground width of the line representing the contact is about 80 feet at this scale (1:24,000).

Flood-scoured basalt surface (see *Qabs* description).

Flow direction of Bonneville Flood.

— Relict cataracts of Bonneville Flood.

Gravel pit that exposes a map unit.

Canal: Trace of major irrigation canal zone that includes area of excavation and side-casted fill. Zone of disturbance ranges 50-300 feet wide.

Sample site for paleomagnetic analysis.*

Sample site for chemical and paleomagnetic analysis.*

*Data available at Idaho Geological Survey, igs@uidaho.edu.

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